1995 Abstract Form
for Scientific Presentations
SOCIETY OF MAGNETIC RESONANCE
THIRD SCIENTIFIC MEETING

EUROPEAN SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE AND BIOLOGY
TWELFTH ANNUAL MEETING

Nice Acropolis, NICE, FRANCE
August 19-25, 1995

☑ Prefer Oral Presentation but willing to present as a poster
☐ Prefer Poster but willing to make Oral Presentation
☐ Poster Only
☐ Video required (available only for Oral Presentations)

TOPIC CATEGORIES
AUTHORS SHOULD FILL IN A NUMERICAL CATEGORY

IMAGING
SUBCATEGORY ☑ 4
1. Brain—Animal Studies
2. Brain—Human White Matter
3. Brain—Human Other
4. Functional Neuro—Clinical
5. Head, Neck, Spine and Other
6. Cardiovascular
7. Cardiac Dynamics and Flow
8. Cardiovascular—Clinical
9. Breast/Chest
10. Gastrointestinal
11. Genitourinary
12. Joints, Cartilage, Bone and Marrow
13. Vascular Imaging
14. Interventional MRI

SPECTROSCOPY
SUBCATEGORY ☐
1. Spectroscopic Imaging Techniques
2. Multinuclear Spectroscopy
3. Spectroscopic Quantitation
4. Human Brain—White Matter & Neuro Degenerative
5. Human Brain—Stroke & Seizure
6. Human Brain—Other
7. Animal Brain
8. Cardiovascular
9. Abdominal
10. Musculoskeletal
11. Tumors—Methods and Animal Models
12. Tumors—Clinical
13. Other (including body fluids)

METHODOLOGY
SUBCATEGORY ☐
1. Angiography
2. Flow Quantification
3. Perfusion
4. Diffusion
5. Functional Neuro—Methodology and Analysis
6. Functional Neuro—Models and Mechanisms
7. Microscopy, Non-proton Imaging and ESR
8. Gradients and Hardware
9. RF Coils
10. RF Pulses
11. Rapid Imaging
12. Spatial Localization/Imaging
13. Motion and Artifacts
14. Other Sequences/Techniques
15. Quantitative Imaging
16. Image Processing
17. 3D Display/Rendering
18. Contrast Mechanisms/MTC
19. Paramagnetic Contrast Agents
20. Other Contrast Agents
21. Safety/Bioeffects
22. Interventional MRI

ABSTRACT DEADLINE:
Received no later than April 11, 1995.

MAIL TO:
Society of Magnetic Resonance
Third Scientific Meeting
2118 Milvia Street, Suite 201
Berkeley, CA 94704, USA

Authors mailing abstracts from outside the USA should allow six weeks for mailing or send abstracts by express.

Please type the name and complete mailing address of the first author.
Name DR. P.W.R. WOODRUFF
Address INSTITUTE OF PSYCHIATRY, DE CRESPIGNY PARK, DENMARK HILL,
Country LONDON, SE5 8AF U.K.
Telephone
Fax 071 701 9044
Member of SMR? ☑ Yes ☐ No

For Office Use Only.
PROGRAM #

Effect of Selective Attention on activity within Auditory and Occipital Cortex as demonstrated using Functional MRI

P.W.R. Woodruff [1,2], R.R. Benson [1], T. Telavage [1], P.A. Bandettini [1], K.K. Kwong [1], H.C. Breiter [1], R. Howard [2], J.W. Belliveau [1], T. J. Brady[1], B.R. Rosen[1].
[1]Massachusetts General Hospital NMR-Center, Boston, USA & [2]Institute of Psychiatry, London, U.K.

Introduction

Selective attention is a process that allows some stimuli to be processed more rapidly or effectively than others. Attention is thought to operate at a series of stages in the pathway of sensory processing. Visual selective attention enhances extra-striate cortex activity demonstrable using PET (1). Electrical and magnetic recordings of human brain activity have demonstrated that attended stimuli evoke enhanced sensory responses in both visual *and* auditory modalities (2). Using fMRI and *surface coil* over the left temporal lobe, we have previously demonstrated that activation of auditory cortex was modulated by attention to auditory versus visual stimuli (3). The purpose of this study was to extend our examination to the whole head, to determine whether: 1) laterality differences in modulation of auditory cortex were observable, and 2) attention away from auditory towards visual stimuli might modulate regions in occipital cortex.

Methods

Four healthy right-handed male subjects 29 - 38 years old were imaged whilst alternatively attending to either visual or auditory stimuli. Subjects were simultaneously presented with pseudorandom numbers from 1-9 visually and aurally and instructed to press a key when they either either *heard* or *saw* the number "8". They were cued with "listen" and "look" at transitions. A 1.5 Tesla GE Signal scanner with EPI and head coil were used with an ASE sequence (TR=1.8-2.15;170 images per slice; voxel size 3x3x5mm). Slices parallel to the Sylvian fissure were taken to include temporal and occipital lobes. Statistical maps were generated using the Kolmogorov-Smirnov statistic between conditions and threshold for significance was $p<0.001$. Anatomical localisation was achieved using high resolution MRI images in two planes and a template derived from the Talairach Atlas for each slice.

Results

In three of four subjects, "auditory attend" minus "visual attend" demonstrated significant areas of activation ($p<0.001$) in primary auditory cortex, posterior STG and MTG. For this condition, areas of activation were greater in left than right temporal lobes for these three subjects. Signal changes ranged from 1-4%. No significant activation was noted in occipital lobes. For "visual attend" minus "auditory attend" conditions, all four subjects exhibited significant activation ($p<0.001$) in both occipital lobes (mainly middle occipital gyrus) with signal changes of 1-4.6% There was a tendency for drop in signal intensity over occipital regions to coincide with transition to the "attend auditory" condition (Fig. 2).

Conclusions

Modulation of auditory cortex activity by attention was predominantly left sided. This suggests that auditory attention shares the same laterality preference as does language. Switching attention between auditory and visual modality was accompanied by modified signal in temporal and occipital cortical regions respectively. Attention may enhance signal within the corresponding modality. Alternatively, attention within one sensory modality may reciprocally inhibit cortical brain regions subserving the other.

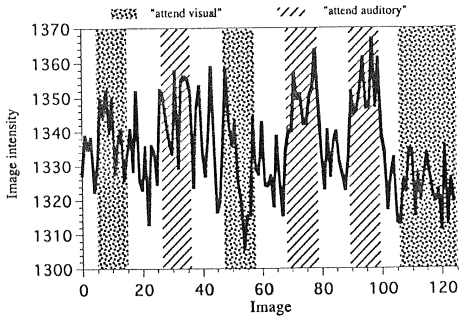

Fig. 1. Signal over left posterior STG during "auditory attend" minus "visual attend".

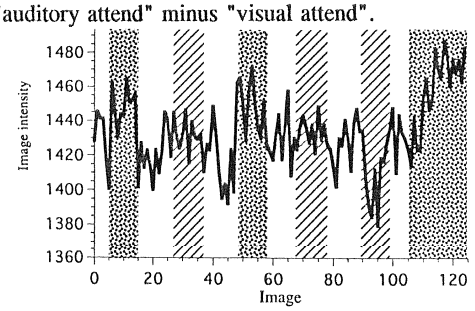

Fig. 2. Signal over left middle occipital lobe during "attend visual" minus attend auditory condition.

For Figs. 1 & 2 white bars represent baseline condition of looking at a fixation point.

References

Heinze HJ et al., *Nature* 372, 543-6, 1994.
Woldorff MG et al., *Proc. Natl. Acad. Sci.* 90, 8722-6, 1993.
Woodruff PWR et al., *1st. International Conference on Functional Mapping of the Human Brain.* Paris, France, June, 1995.